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Is the Revolution Here?

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We are on the verge of a revolution in education.

Now, this is not the first time that someone has said education was about to change. Famously, Thomas Edison (1922) thought that his motion picture invention was going to dramatically influence schools: "The motion picture is destined to revolutionize our educational system and… in a few years it will supplant largely, if not entirely, the use of textbooks." [1] Why have just words on a page when you can teach with action, sound, and exciting video? Seemed like a reasonable prediction at the time. Similar predictions were made about radio and television. From the chalkboard to the pencil to moving images to the computer, technologies have entered into the educational space with limited impact on teaching. We are always looking for the next big thing, the key piece of the puzzle that will inspire educational change.

Of course, it is not easy to change a massive system with a resistant culture. John Gardner, Secretary of Health, Education, and Welfare, wrote in 1969 that "I am entirely certain that twenty years from now we will look back at education as it is practiced in most schools today and wonder that we could have tolerated anything so primitive." Needless to say, some might believe that education hasn't changed all that much since Gardner's twenty year prediction. With a few computers gathering dust in the back of many classrooms, people are still looking at education today and thinking it is primitive in light of the resources and potential of education in the 21st century. Larry Cuban, a former social studies teacher and then professor at Stanford University, said that there is a cycle to new technologies entering into education including exhilaration, scientific credibility, and disappointment that ands ends in teacher-bashing:

> *The cycle begins with a period of excitement in which reformers…tout new technologies as solutions for whatever ails the nation's schools. Shortly after the new technologies gain some attention, academics produce studies describing the effectiveness of the new tools. As the technologies fail to gain widespread acceptance in schools, new surveys document the disappointingly infrequent use of the technologies by educators. During the final phase of the cycle, teachers are criticized for resisting change and subverting the improvementmade possible by the new technologies (1986, p. 22).*[2]

1 Quoted in Cuban (1986), p. 9.
2 Originally from an entry on the website Student 2.0, which is no longer accessible. Chivetta can be

When those new technologies don't change the system, it is pretty easy to find a scapegoat, and teachers are easy targets. Now, there are some good reasons and perhaps not so good reasons that the status quo is so strong. Fast changes can take us in unproductive directions, but slow changes may miss opportunities. Similarly, a bad teacher can take anything and make it not work. A great teacher can take anything, shake things up, and use it to inspire heavens to open for 13-year-olds. So, in the spirit of reckless prediction I say the revolution in education is beginning today. Mobile technologies are about to tip the balance. Here is the perspective of Anthony Chivetta, a high school student in Missouri:

> *The need to know the capital of Florida died when my phone learned the answer. Rather, the students of tomorrow need to be able to think creatively: they will need to learn on their own, adapt to new challenges and innovate on-the-fly.*

In order to be successful in the world today, your success is not so much about your knowledge in the moment, but about how you adapt in the future. So this student is right on with what I think we need in our educational system. Yet, information has been at our fingertips for a decade or so and schools haven't significantly changed. In spite of this student's plea, technology has still not significantly reached into the classroom and changed the dynamic. Cell phones are prohibited in most classrooms So, why am I optimistic? What does it take to move mountains? Apple gets most of the press for their very cool iPad because they have sold 84 million of them in less than two years. That is pretty impressive. 1.5 million have gone into schools in the past year. Android tablets will likely catch up at some point and surpass Apple in the classroom. Amazon has a lot of weight, so the Kindle fire, another very cool device, which also runs Android, might be attractive to a lot of schools at a lower price.

Some companies, such as Kuno [3], are even aiming their tablets directly at schools. I think the tablet starts the revolution for a number of reasons.

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found at http://www.chivetta.org.

3 See http://www.business2community.com/tech-gadgets/this-is-the-biggest-competitor-to-the-ipad-in-the-hot-education-market-0284912, and http://www.mykuno.com/

Capability

Tablets have longer lasting batteries, instant on, cameras, GPS, Internet, graphing calculators, video editing, word processors, presentation apps, sound, touch, and translation of anything. They can record kids reading, have things spoken aloud, and provide virtual manipulatives to help students think in new ways. Students can do things with an app that they can't do with paper. For example, the Center for Algebraic Thinking (www.algebraicthinking.org) is creating virtual manipulatives for iPads that can be powerful teaching tools. One app is called Action Grapher. Research has found that students have misconceptions about graphing. If you want them to graph a ball being thrown from one person to the other, you can probably guess what they think. No matter how you label the axes, they think the graph matches the arc of the ball. Action Grapher animates a biker climbing a terrain while three different graphs: of speed, distance, and height are represented. But first, students can use their fingers to draw what they think each graph will look like. They then animate the graph and compare what they expected to what actually happens to each graph as the biker rides the hills. With touch screens, interaction with tablets is uniquely suited to learning like this. *(See following page for picture)*

iPad
8:49 AM
100%
Playing
Replay
Resume
Elevation
Distance
Speed
Flask
Bicycle
Doodle

Alternative to Traditional Textbooks

Tablets are well suited to serve as deliverers of digital textbooks. Last year Amazon announced that they now sell more digital books than paper books (Cain-Miller & Bosman, 2011). All school districts in Florida will be using digital textbooks within three years (Rockwell, 2011). Publishing companies are scrambling to develop eTexts right now (Schuetze, 2011). I was in a textbook adoption committee for the state this summer and just about every publisher was talking about their digital editions. Digital textbooks can easily be updated so a student isn't learning about last year's science or stuck with errors in a textbook; digital textbooks can easily be modified to fit state requirements. With new interactive textbooks, the very definition of a "textbook" is changing pretty dramatically. They can include videos, interactive diagrams, and practice tests that give a student feedback.

Price

The biggest obstacle to bringing technology to schools is cost. School districts spend about $200 per student per year on textbooks. Tablets are getting cheaper. They are easier to maintain than desktops and laptops, and competition is increasing. In India they have developed a $60 tablet that the government purchases for schools (Daniel, 2011). However, until it costs less to use textbooks digitally than in print, there is no way cash-strapped schools can afford to buy tablets that they will have to replace every 4-5 years. Digital textbooks don't need shipping, which is a major cost for the publishing industry and schools. For the moment, though, textbook publishers are not charging any less for these digital editions. However, there will be a price tipping point when tablets and digital textbooks make sense for districts and states. Florida has already tipped.

There is another game changer regarding price: you can make your own textbook! Skip the publishing companies all together! With Apple's iBooks Author, Amazon's Kindle Direct, etc. states, school districts, and teachers can create textbooks. iBooks Author, in particular, makes it incredibly easy to create pretty cool textbooks that can be freely distributed to students.
Enter sites like CK12.org. Not only does CK12 offer free textbooks, but they also allow educators to take any part of a textbook, mix it with others, or with their own material. This allows educators to create customized class texts that meet state standards. Current titles cover mostly math and science, but language arts and social studies textbooks are beginning to appear. States can still oversee the adoption of these texts so that the material is ensured to be accurate and in alignment with state goals.

Or, just skip textbooks altogether. A number of districts are deciding that Internet resources are all they need for some subjects, so they are stopping the purchase of textbooks for that content (Ryan, 2012). I have been in a number of social studies classes in our local school district that are taught in computer labs without textbooks. For example, there are over 100,000 public domain digital books available through sites like Project Gutenberg. Students have free access to works such as Mark Twain, Frankenstein, Dickens, Bronte, Jane Austen, Ulysses, etc. They can take notes by writing all over the screens of their tablets.

Perhaps the biggest potential for tablets is the role they will play in testing. In 2014, Oregon and many other states' students will have to pass the Common Core State Standards. Guess what devices are being prepared to implement the test? Smarter Balanced and PARCC are the companies providing the national assessment for at least 42 states, and they recently approved iPads to deliver the test. [4]
Schools need students to do well on the test. With tablets they can administer practice tests at will. While it takes weeks to run all students through a single computer lab, a school with tablets could do it in only a day. Individualized computer programs on tablets can meet students' needs and work on areas of weakness to prepare them for the tests. Which leads me to the fly in the ointment, the hair in your soup…

Let's say, for the sake of argument, that my prediction comes true. All students will have tablet computers. In his article, "Will computers replace schoolteachers?" Ferenstein (2011) begins

> *Cash strapped school districts, from Florida to Washington, have discovered minimally supervised students hunched over laptops can outperform their lectured counterparts for a fraction of the cost.*

Florida has research that says 100 students in a big room with computers and one teacher learn as much, if not more, than in our current system of one teacher per thirty students. Uh-oh…As long as schools simply measure performance by multiple-choice tests of rote memorization, no teacher can compete with instant access to the world's information. Nor can they compete with individualized computer programs that can adapt minute by minute to students' keystrokes. Students can have the best lecturer in the country on a topic downloaded from Youtube or iTunes U rather than the local teacher. Programs like Udacity are popping up all over to provide that type of content to students for free.

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4 See http://appleupdatesdotcom.wordpress.com/2012/05/14/smarter-balanced-parcc-consortiums-ios-and-the-ipad-will-fit-with-the-minimum-technology-standards-for-future-online-assessments/

So the question for educators is: Are you teaching in a way that a computer couldn't do better?

In the world of business, they talk about value added. What will be the value teachers add? What can teachers offer students that computers can't? And, how can teachers use computers teaching aids?

In a revolution you are typically running from something. In our budding revolution, what are we running from? Computers. Computers can make classrooms all about information bytes and testing what is easily measured. They can push us towards isolating students so they have their individual needs met by an all-knowing machine. This is the moment of truth!

Although it may sound a bit depressing, I'm excited. What an amazing time to be entering education! We have no alternative as teachers but to reinvent education; to take control of the future. I'm feeling pretty inspired. As computer scientist Alan Kay once noted, "The best way to predict the future is to invent it." [5]

We have to rethink what happens in our classrooms as tablets appear. Students are entering a world where they have to be prepared to "learn, unlearn, and relearn" (Toffler, 1970) and be able to do things we cannot predict. The tools that we will have as teachers have incredible potential for helping us redefine why and how we teach.

One of the biggest issues for technology integration right now is the digital divide. I hear teachers saying, "Well, I can't do that with my students because they don't have computers in their homes." All that changes when tablets appear and students are taking them home instead of textbooks. When every student has access both at home and at school, how does that change the way we think about the classroom? One recent response among teachers is the idea of "Flipping the classroom," where students hear lectures at home and come prepared to discuss and engage in activity in school. [6]

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5 See http://www.ecotopia.com/webpress/futures.htm.
6 See http://www.thedailyriff.com/articles/how-the-flipped-classroom-is-radically-transforming-learning-536.php

Now I'm not saying flipping the classroom is the answer. The neat thing here is that teachers are reinventing what they do because they have the technology to do so. You certainly don't need technology to be a great teacher, or to think about engaging in ways to teach better than a computer. Most teachers don't have tablets in their classroom right now. However, they might be coming sooner than you imagine. Whatever your current situation, I encourage you, as teachers, to keep asking yourselves this question: Are you teaching in a way that a computer couldn't do better?

The revolution is not about a bunch of machines. It is not about tablets becoming ubiquitous in classrooms. It is us, the teachers, responding to new possibilities.

So, is the revolution here, in each of us?

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